AND

19 SEPTEMBER 1979 (FOUO 6/79) 1 OF 1

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19 September 1979

USSR Report

ENGINEERING AND EQUIPMENT

(FOUO 6/79)

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USSR REPORT

ENGINEERING AND EQUIPMENT

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Aeronautical and Space

USSR

UDC: 629.78.076.6

ONE PRINCIPLE OF MEASUREMENT OF THE ANGLE OF ATTACK AND GLANCING ANGLE DURING FLIGHT OF SPACECRAFT IN NEAR SPACE AND IN THE ATMOSPHERE

Moscow TRUDY SED'MOGO MEZHDUNARODNOGO SIMPOZIUMA IFAK PO AVTOMATICHESKOMU UPRAVLENIYU V PROSTRASTVE, ROTTAKH-EGERN, MAY, 1976 g., T. 4. DATCHIKI I VSPOMOGATEL'NYYE SISTEMY KOSMICHESKIKH APPARATOV, ROBOTY I MANIPULYATORY [Proceedings of the Seventh International Symposium of the International Federation of Automatic Control (IFAC) on Automatic Control in Space, Rottach-Egern, May 1976, Vol 4. Sensors and Auxiliary Spacecraft Systems, Robits and Manipulators] in Russian, n. d., pp 39-48

KRYMOV, A. B.

[From REFERATIVNYY ZHURNAL, BAKESTOSTROYENIYA, No 2, 1979 Abstract No 2.41.66 from the resume]

[Text] The principle of measurement studied in the article is based on analysis of the distribution of dynamic pressure over a meridional cross section of a spherical element, a part of the nose cone of a spacecraft, during atmospheric flight, and analysis of the distribution of the ion flow, recorded by ion traps with axes of sensitivity placed on predetermined planes on the spacecraft. Algorithms constructed according to the same principle are presented, both for atmospheric flight and for space flight, for processing of the information of these primary transducers to determine the angle of attack and glancing angle over a broad range of their variation. Figures 13; References 3.

[240-6508]

USSR UDC: 629.78.086

ENGINEERING AND ECONOMIC OPTIMIZATION OF SPACE MISSIONS WITH DISTRIBUTION OF FUNCTIONS BETWEEN THE SPACECRAFT AND GROUND CONTROL CENTER

Moscow TRUDY SED'MOGO MEZHDUNARODNOGO SIMPOZIUMA IFAK PO AVTOMATICHESKOMU UPRAVLENIYU V PROSTRANSTVE, ROTTAKH-EGERN, MAY, 1976 [Proceedings of the Seventh International Symposium of the International Federation of Automatic Control (IFAC) on Automatic Control in Space, Rottach-Egern, May 1976] in Russian Vol 1, 1978 49-57

FURN'YE, M. P.

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE, No 11, 1979, Abstract No 11.41.266 from the resume]

[Text] A study is made of the basic functional tasks performed by a satellite TV broadcasting system. A comparative analysis is presented of several European plans for the organization of TV broadcasting, including their economic effectiveness, and the basic conditions of optimal functioning of complex space systems such as orbital space stations and landers are discussed. Two characteristics are introduced to evaluate the operational capabilities of systems--the system reaction time and the frequency of changes of functions performed by the system. Figure 1.

[243-6508]

USSR UDC: 629.78.017.2

STOCHASTIC TERMINAL CONTROL OF A SPACE SHUTTLE

Moscow TRUDY SED'MOGO MEZHDUNARODNOGO SIMPOZIUMA IFAK PO AVTOMATICHESKOMU UPRAVLENIYU V PROSTRANSTVE, ROTTAKH-EGERN, MAY, 1976 g. [Proceedings of the Seventh International Symposium of the International Federation of Automatic Control (IFAC) on Automatic Control in Space, Rottach-Egern, MAY 1976] in Russian Vol 1, 1978 pp 69-76

PETROV, B. N., LOPATIN, V. I., MITROSHIN, E. I., VASIL'EV, V. A. and PAVLENKO, A. I.

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE, No 11, 1979, Abstract No 11.41.87, from the resume]

[Text] A study is made of problems of terminal control of a shuttlecraft in various sections of the flight trajectory. It is suggested that the principle of production of the maximum guaranteed result be used to

synthesize the control system in situations when a broad spectrum of perturbations is present and it is impossible to generate good information on the spacecraft trajectory parameters. A stochastic statement of the problem is given and the system is synthesized on the basis of methods of control from the theory of stochastic differential games using optimally processed information on the status of the spacecraft. The use of the approach suggested is studied on the example of the control of spacecraft reentry into the atmosphere. Figures 4; References 4.

[243-6508]

USSR UDC: 629.782.062.2

PLANNING OF AN ADAPTIVE SYSTEM FOR IMPROVEMENT OF THE PILOTING CHARACTERISTICS OF A SPACE SHUTTLE

Moscow TRUDY SED'MOGO MEZHDUNARODNOGO SIMPOZIUMA IFAK PO AVTOMATICHESKOMU UPRAVLENIYU V PROSTRANSTVE, ROTTAKH-EGERN, MAY, 1976 g. [Proceedings of the Seventh International Symposium of the International Federation of Automatic Control (IFAC) on Automatic Control in Space, Rottach-Egern, May 1976] in Russian Vol 1, 1978 pp 108-115

ALEKSANDROV, A. D. and TSATURYAN, K. T.

[From REFERATIVNYY ZHURNAL RAKETOSTROYENIYE, No 11, 1979 Abstract No 11.41.189 from the resume]

[Text] The necessity of creating an adaptive system for improvement of the piloting characteristics of shuttle spacecraft is demonstrated. Based on the condition of assurance of stability, specific rules are synthesized for correction of coefficients in the damping, stabilizing and control systems. The rules obtained can be realized in various versions of hardware. A method is presented for selection of a preferable cersion based on a combination of criteria considering, in addition to the dynamic indices of mass, reliability, power consumption, system cost, and so on. Figures 2; References 11.

[243-6508]

USSR UDC: 629.78.066

INFRARED EQUIPMENT AND OUTER SPACE

Moscow INFRAKRASNAYA TEKHNIKA I KOSMOS, in Russian Sov. Radio Press, 1978, 248 pp

SAFRONOV, YU. and ANDRIANOV, YU. G.

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE, No 2, 1979, Abstract No 2.41.18K from the resume]

[Text] A study is made of promising areas of application of IR equipment: space navigation, measurement of distances and tracking of objects in space, space communications, astrophysical research and earth-resource surveys. The book is designed for specialists in the area of IR equipment and those readers interested in its application in the national economy.

[240-6508]

Nuclear Energy

USSR

UDC: 621.039.524.44

OPERATING MODES OF A REACTOR INSTALLATION USING THE VVER-440 REACTOR WITH REDUCED STEAM PARAMETERS IN THE SECONDARY LOOP

Apatity RAZVITIYA ENERGOSNABZHENIYA SEVERA YEVROPEYSKOY CHASTI SSR [development of Energy Supply in the Northern Part of the European USSR] in Russian, 1978 pp 33-37

ZVERKOV, V. V., IGNATENKO, YE. I. and LITVINOV, A. N.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 5, 1979 Abstract No 5U147 by G. I. Korotkina]

[Text] Series-produced VVER-440 reactors can be used with anywhere from 3 to 6 primary cooling loops. The variation of steam pressure in the main steam collector with coolant temperature at the inlet to the nuclear reactor is shown. A decrease in temperature allows an increase in the safety reserve for development of a heat-exchange crisis in the core with constant pressure in the primary loop, by decreasing the steam pressure in the secondary loop. A study is made of the variation in critical power of the fuel assembly as a function of discharge at various coolent inlet temperatures. The calculations are performed for coolant temperatures at the inlet to the fuel assembly of 240-270 C. The primary operating modes are assumed for the VVER-440 units, determined by disconnection of some or all of the main circulating pumps. The maximum level of power developed by the VVER-440 unit with the inlet temperature reduced to 246° C is as follows (% of nominal): with six loops in operation - 117; five loops - 91; four loops - 68; three loops -39. Information is presented on nuclear reactor power levels for various operating modes. Figures 2; Tables 3; References 3.

[253-6508]

USSR UDC: 621.039.526.001.572

MODEL AND ALGORITHM FOR RAPID PROCESSING OF INFORMATION ON THE STATUS OF THE FUEL ELEMENTS IN FAST REACTORS, USING THE CRITERION OF REPAIRABILITY

Moscow VOPROSY ATOMNOY NAUKI I TEKHNIKI. YADERNOYE PRIBOROSTROYENIYE [Problems of Nuclear Science and Engineering. Nuclear Instrument Making] in Russian No 38, 1978 pp 78-83

YEFIMOV, I. A., LOPATIN, YU. V., MAMAYEV, L. I., RYSEV, A. M., STABROVSKIY, S. A. and FILONOV, V. S.

[From REFRERATIVNYY ZHURNAL, TEPLOENERGETIKA No 4, 1979 Abstract 4U274]

[Text] Algorithms are presented for machine processing of information received from a device which tests the gas-tightness of fuel element cladding to be used in the BR-10 nuclear reactor. The condition of the fuel elements is evaluated on the basis of the variation of leakage of fission products into the loop as a function of operating mode of the reactor. Four computational sections are studied, intended for use during various operating modes of the reactor: steady, transient or limiting. Processing of the data supplied by the test hardware can generate the following output information: type of leak and an estimate of its rate, the effective area for contamination and leakage (small crack, gas leak, crack involving contact between fuel and coolant, crack with erosion of fuel); number of defective fuel elements of each type; prediction of the radiation situation in the loop for the immediate future. It is noted that after testing and debugging of the algorithms on the BR-10, they can be used in full-scale fast reactors with liquid-metal coolant. Figure 1; References 4.

[252-6508]

USSR UDC: 621.311.25:621.039.002.5 (088.8)

A HEAT EXCHANGER

USSR Author's Certificate No 590547 filed 25 Dec 73, published 28 Mar 78

TITOV, V. F., KHALETSKIY, E. E., DENISOV, V. V., ANDREYEV, L. M. and MAKSIMENKO, YU. V.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 4, 1979, Abstract 4U121P by G. I. Korotkina]

[Text] The invention relates to the area of steam-generating equipment

and can be used, for example, in nuclear powerplants with liquid-metal sodium coolant to generate steam at high parameters, with simultaneous super-heating of intermediate steam. Heat exchangers are known in which the heat-transfer medium moves in the space between tubes. The purpose of this invention is to increase the operational safety of the heat exchanger and simplify its design. This purpose is achieved by making the heat exchanger with two sections, one of which contains two concentrically located tubes, the space between which is connected to the tubes of the other section, the second section is made in the form of three concentric tubes, and the space of the inner tube of the first section is connected to the space formed by the inner and middle tubes of the second section. The proposed heat exchanger is diagrammed. The operating principle of the heat exchanger is demonstrated. Figure 1.

[252-6508]

USSR UDC: 621.039.536.2(088.8)

A BUTT JOINT BETWEEN A GAS-TIGHT STEEL SHELL AND THE CONCRETE SURFACE WHICH IT PROTECTS

USSR Author's Certificate No. 617551, Filed 29 Apr 76, Published 21 Jul 78

KIRILLOV, A. P., NIKOLAYEV, V. B., SPIRKIN, V. YA. and SEMENOV, V. P., Scientific Research Section of the National Planning, Design and Scientific Research Institute "Gidroproyekt"

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 5, 1979 Abstract 5U277P by G. I. Korotkina]

[Text] Heat insulation is proposed for the hot units of a nuclear powerplant using a type RBMK reactor. The closest engineering solution to that suggested is a butt joint of a gas-tight steel shell with a protected concrete surface, including connecting elements attached to the shell and to the protected surface. One shortcoming of this type of butt joint is that a temperature of up to 140°C is "transmitted" to the protected concrete surface at the point where the connecting elements contact the surface when the operating temperature inside the reactor vessel is 285°C, while the maximum permissible temperature of the concrete is 60°C. The purpose of this invention is to reduce the temperature at the concrete surface in the area where the connecting elements contact it. Figure 1; References 2.

[253-6508]

Non-Nuclear Energy

USSR UDC: 621.482(47+57)

EXPERIENCE IN OPERATING THE PARATUNSKAYA GEOTHERMAL ELECTRIC POWERPLANT AND PROSPECTS FOR THE USE OF FREON POWER UNITS

Obninsk PERSPEKTIVY RAZVITIYA I SOVERSHENTSVOVANIYA TOPLIVNO-ENERGETICHESKOGO KHOZYAYSTVA RAYONOV KRAYNEGO SEVERA I SEVERNO-VOSTKOVA SSSR NA BAZE YADERNYKH ENERGOISTOCHNIKOV [Outlook for Development and Perfection of Fuel and Energy Facilities in the Soviet Far North and Northeast Based on Nuclear Power Sources] in Russian, 1978 pp 113-129

MOSKVICHEVA, V. N. and OGURECHNIKOV, L A.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 4, 1979, Abstract 4S100]

[Text] This report outlines the experience of development, design, construction and operation of an experimental electric power generating unit with a freon turbine, created by the Institute of Thermal Physics, Siberian Division, Academy of Sciences USSR, in cooperation with the All-Union Scientific Research Institute for Refrigeration Machinery and "Krasnyy fakel" Plant. Basically new design decisions related to the operation of a turbine with freon vapor and providing for the production of electric power in a complete technological system are outlined. The basic technological system of the power unit is presented and its operating principle outlined. The Institute of Thermal Physics has developed a mathematical model for evaluation of the influence of various factors on the technical and economic indices of freon power units and selection of the optimal parameters, providing for the minimum cost per unit. The results of thermodynamic and technical-economic studies using this model are presented, as applicable to the central regions of the European portion of the country for 1500 kW freon installations utilizing waste heat (water at 115°C). These power units are shown to be promising and possible areas of their effective utilization are listed. Figures 10.

[252-6508]

USSR UDC: 629.78.062.2

GYROSCOPIC DRIVES

Moscow GIROSKOPICHESKIYE PRIVODY in Russian Mashinostroyeniye 1978 192 pp

NEUSYPIN, A. K.

[From REFERATIVNYY ZHURNAL, BAKESTOSTROYENIYE, No 2, 1979 Abstract No 2.41.188K from the resume]

[Text] The principles are outlined of the theory of gyroscopic drives of homing devices. Mathematical models and structural systems are developed for a number of gyroscopic drives, and the method is presented for their analytic solution. Primary attention is given to the theory and calculation of systematic errors in gyroscopic drives, both in the linear approximation, and considering nonlinearities. Equations are developed for synchronous and systematic errors for various gyroscopic drive systems. The book is intended for engineers and scientific workers involved in research and the planning of autonomous navigation and gyroscopic stabilization systems. It will also be useful to teachers, students and graduate students at technical higher educational institutions.

[240-6508]

USSR UDC: 629.78.017.2

ESTIMATE OF THE INFLUENCE OF THE ELASTICITY OF ATTACHED ELEMENTS OF A STRUCTURE OF THE NATURAL OSCILLATIONS OF SPACECRAFT WITH A GAS-JET ATTITUDE CONTROL SYSTEM

OTSENKA VLIYANIYA UPRUGOSTI PRISOYEDINENNYKH ELEMENTOV KONSTRUKTSII NA AVTOKOLEBANIYA KOSMICHESKOGO LETATEL'NOGO APPARATA S GAZOREAKTIVNOY SISTEMOY UPRAVLENIYA in Russian, Preprint No 407, 1978, Institute of Space Research, Academy of Sciences USSR, 54 pp

SASIN, G. G.

[From REFERATIVNYY ZHURNAL, RAKESTOSTROYENIYE, No 2, 1979 Abstract No. 2.41.64 from the resume]

[Text] A study is presented of the influence of the elasticity of attached elements of a structure on the natural oscillations of a spacecraft which uses a gas-jet attitude control system. Based on the method of mixed coordinates, a mathematical model is produced of a generalized nonrigid

spacecraft, the gas-jet nozzles of which apply a controlling action to the main frame of the spacecraft. Various structural forms are obtained for the transfer functions describing the nonrigid spacecraft as a system consisting of a rigid central body with elastic structural elements attached to it. The study of the natural oscillation processes is performed by means of the method of point transforms. Equations are found for the correspondence function and for the speed in the limiting cycle, considering the delay in a relay element and in the actuating element. These equations are studied by analog and digital computers.

[240-6508]

USSR UDC: 629.78.062.2

PLANNING OF MANUAL SPACECRAFT CONTROL SYSTEMS

Moscow PROEKTIROVANIYE SISTEM RUCHNOGO UPRAVLENIYA KOSMICHESKIKH KORABLEY in Russian Mashinostroeniye 1978, 143 pp

KLIMOV, V. A., BLUDOV, B. V., VASILETS, V. M., LEONIDOV, V. A., NIKOL'SKIY, V. V., TUMANOV, A. V. and YAKOVLEV, A. I.

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE, No 11, 1979 Abstract No 11.41.181K from the resume]

[Text] Various tasks involved in the planning of spacecraft manual control systems are analyzed. The primary, general stages in the planning of such systems are formulated. The specific of physical and mathematical modeling are described. A mathematical description of the actions of an operator is presented. New algorithms for mathematical modeling of spacecraft manual control systems are presented, which have certain advantages in terms of assurance of computational stability and accuracy of computations, and require relatively little machine time to model both linear and nonlinear systems. The book is designed for engineering and technical workers specializing in the area of planning of spacecraft control systems. It may also be useful to scientific workers, undergraduate and graduate students in higher educational institutions with the corresponding specialities.

[243-6508]

USSR UDC: 629.78.062.2

SPACECRAFT FLIGHT CONTROL SYSTEMS

Moscow SISTEMY UPRAVLENIYA POLETOM KOSMICHESKIKH APPARATOV in Russian MASHINOSTROENIYE 1978, 272 pp

BEBENIN, G. G., SKREBUSHESKIY, B. S. and SOKOLOV, G. A.

[From REFERATIVNYY ZHURNAL RAKETOSTROYENIYE, No 11, 1979 Abstract No 11.41.180K from the resume]

[Text] Methods are outlined for performing the most important tasks involved in the control of spacecraft. Primary attention is given to problems of prediction and determination of orbits, generation of rules for control of the movement of the center of mass of the vehicle and movement of the vehicle relative to its center of mass. The specifics of practical computer solution of a number of problems which are difficult for formal analysis are analyzed. The pecularities of control of a network of spacecraft are analyzed, considering deformation of the initial orbital structure.

[243-6508]

USSR UDC: 629.78.062.2

CONTROL SYSTEMS, PROCEEDINGS OF THE SEVENTH IFAC INTERNATIONAL SYMPOSIUM ON AUTOMATIC CONTROL IN SPACE, 4 VOLUMES, ROTTACH-EGERN, MAY 1976

Moscow SISTEMY UPRAVLENIYA. TRUDY SED'MOGO MEZHDUNARODNOGO SIMPOZIUMA IFAK PO AVTOMATICHESKOMU UPRAVLENIYU V PROSTRANSTVE, 4-KH, ROTTAKH EGERN, MAY, 1976 in Russian, Nauka, 1978, 118 pp

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE, No 11, 1979 Abstract No 11.41.182K from the resume]

[Text] A study is made of general problems of design of control systems for spacecraft of various types. Programs of spacecraft studies of the outer planets in the solar system and other objects in space are outlined for the 1980's. Considerable attention is given to problems of design and control of landers intended for studies of the surfaces of the planets in the solar system. This collection is designed for a broad range of engineers, graduate students and scientific workers in the area of automatic control.

[2430-6508]

USSR UDC: 629.78.062.2

A DIGITAL SYSTEM FOR STABILIZATION OF A SPACE SHUTTLE

Moscow TRUDY SED'MOGO MEZHDUNARODNOGO SIMPOZIUMA IFAK PO AVTOMATICHESKOMU UPRAVLENIYE V PROSTRANSTVE, ROTTAKH-EGERN, MAY, 1976 g. [Proceedings fo the Seventh International Symposium of the International Federation of Automatic Control (IFAC) on Automatic Control in Space, Rottach-Egern, May, 1976]

NIKOLAYEV, YU. A., TERYAYEV, YE. D. and SHAMRIKOV, B. M.

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE No 11, 1979 Abstract No 11.41.186 from the resume]

[Text] A study is made of the problem of stabilization and control of a space shuttle which is piloted during the atmospheric portion of its flight. The studies are performed using a model of shortperiod motion in the longitudinal plane. The control requirements are met by restructuring the parameters of the regulator on the basis of information obtained during parametric identification of the parameters of the controlled object. Figures 3; References 2.

[243-6508]

USSR UDC: 629.786.2.062.2

AN ELECTROMECHANICAL SYSTEM FOR ORIENTATION AND STABILIZATION OF AUTONOMOUS MODULES AND LIGHT ORBITAL STATIONS

Moscow TRUDY SED'MOGO MEZHDUNARODNOGO SIMPOZIUMA IFAK PO AVTOMATICHESKOMU UPRAVLENIYE V PROSTRANSTVE, ROTTAKH-EGERN, MAY, 1976 g. [Proceedings of the Seventh International Symposium of the International Federation of Automatic Control (IFAC) on Automatic Control in Space, Rottach-Egern, May 1976] in Russian Vol 1, 1978 pp 89-95

PETROV, B. N., SHEREMET'YEVSKIY, N. N., DANILOV-NITUSOV, N. N. and VEYNBERG, D. M.

[From REFERATIVNYY ZHURNAL RAKETOSTROYENIYE No 11, 1979 Abstract No 11.41.188 from the resume]

[Text] A study is made of the relationship between the devices of orbital stations and attitude of control systems, as well as the discharge of mass and power consumption of a station controlled by electromechanical systems. Recommendations are given for the use of equipment for orientation toward the Earth or stars by rotation around its longitudinal axis, oriented in

the orbital plane. An electromechanical system can make the transition from orbital to inertial orientation without using jet engines, and thereby cancel out gravitational moments without consuming fuel. A discussion is presented of the advantages of a flywheel system, particularly a combination of a stabilizing spherical flywheel with a circular flywheel. A study is made of the problem of optimization of the design of a circular flywheel and the electromechanical parameters of the system. The basic characteristics of an attitude control system for small orbital spacecraft with circular and spherical flywheel motors are presented. Figures 8; References 4.

[243-6508]

USSR

UDC: 629.78.017.2

DETERMINATION OF THE ANGULAR POSITION OF A SPACECRAFT FROM TELEMETRY DATA

Ramenskoye UCHENYYE ZAPISKI TSENTRAL'NOGO AEROGIDRODINAMICHESKOGO INSTITUTA [Scientific Annals of Central Aerohydrodynamice Institute] in Russian No 9, 1978 pp 115-121

BELYAYEV, M. YU.

[From REFERATIVNYY ZHURNAL RAKESTOSTROYENIYE No 2, 1979 Abstract No 2.41.65 from the resume]

[Text] A study is made of the method of determining the angular position of nonoriented bodies, based on statistical processing of measurements of the magnetic field intensity vector of the earth. Several advantages of the proposed method over known methods of calculation of spacecraft orientation are noted. Results are presented from digital computer calculations. Figures 3; References 7.

[240-6508]

High-Energy Devices, Optics and Photography

USSR UDC: 662.997:537.22(088.8)

AN OPTICAL ELEMENT

USSR Author's Certificate No. 631756, Filed 16 Feb 77, Published 10 Nov 78

YELISEYEV, V. G., BITUSHAN, EY. I., BARANOV, V. K., SMYSHLYAYEV, V. I., MASUROV, V. N., SHAPOVALOV, YU. YE., BOLOTIN, YU. I. and KRAVTSOV, V. I.

[From REFERATIVNYY ZHURNAL, TEPLOENERGETIKA No 5, 1979 Abstract No 5G82P]

[Text] An optical element is described which contains a mirror (made of sheet glass), mounted on a backing hinged to a base. To simplify manufacture, a bracket is rigidly attached to the central portion of the mirror on the side of the base, and the bracket is hinged to a screw drive system installed in the base. Figure 1.

[253-6508]

Fluid Mechanics

USSR UDC: 629.78.076.6

A MODEL OF THE UPPER ATMOSPHERE FOR THE PREDICTION OF SATELLITE MOVEMENTS

Moscow NABLYUDENIYE ISKUSSTVENNYKH NEBESNYKH TEL [Observation of Artificial Heavenly Bodies] in Russian No 74, 1977 pp 15-19

DEGTYAREV, M. A.

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE, No 2, 1979 Abstract No 2.41.42 from the resume]

[Text] A model of the atmosphere is presented for the prediction of the movement of satellites. The four unknown coefficients of the model are determined by means of the Yakkia model of 1971 or by analysis of changes in the orbit caused by aerodynamic drag. Figures 2; Table 1, References 7.

[240-6508]

USSR UDC: 629.78.076.6

SOME PROBLEMS OF THE APPLICATION OF AN INTEGRAL MODEL OF THE DENSITY OF THE UPPER ATMOSPHERE TO PROBLEMS OF SPACE BALLISTICS

Moscow NABLYUDENIYE ISKUSSTVENNYKH NEBESNYKH TEL [Observation of Artificial Heavenly Bodies] in Russian No 74, 1977 pp 30-34

SURYUROV, G. S.

[From REFERATIVNYY ZHURNAL, No 2, 1979 Abstract No 2.41.43 from the resume]

[Text] A discussion is presented of the possibility of using an integral representation of the density of the upper atmosphere in the prediction of the movement of satellites, calculation of the time of their existence (t_{ex}), and an estimation of the status of solar activity. Tables 1; References 4.

[240-6508]

USSR UDC: 629.78.076.6

INFLUENCE OF VARIATIONS IN ATMOSPHERIC DENSITY ON THE ACCURACY OF CALCULATION OF ORBITS

Moscow NABLYUDENIYE ISKUSSTVENNYKH NEBESNYKH TEL [Observation of Artificial Heavenly Bodies] in Russian No 74, 1977 pp 57-69

EL'YASBERG, P. YE., KUGAYENKO, B. V. and VOLKOV, I. I.

[From REFERATIVNYY ZHURNAL, BAKETOSTROYENIYE, No 2, 1979 Abstract No 2.41.45 from the resume]

[Text] The task of estimating the accuracy of calculation of low satellite orbits is studied. A method is presented for estimating the influence of variations in density correlating with the indices of geomagnetic disturbance, 27-day variations and errors in the density model. All types of variation are considered random processes with a fixed type of autocorrelation function. Figures 8; References 5.

[240-6508]

USSR UDC: 629.78.076.6

INFLUENCE OF VARIATIONS IN DENSITY OF THE UPPER ATMOSPHERE ON MOVEMENT OF A SATELLITE IN THE GRAVITATIONAL FIELD OF THE EARTH

Moscow NABLYUDENIYE ISKUSSTVENNYKH HEBESNYKH TEL [Observation of Artificial Heavenly Bodies] in Russian No 74, 1977 pp 132-139

DEGTYAREV, M. A. and PETROVSKIY, F. D.

[From REFERATIVNYY ZHURNAL, RAKESTOSTROYENIYE, No 2, 1979 Abstract No 2.41.50 from the resume]

[Text] An estimate is made of the influence of the selection of models of the upper atmosphere CIRA 1972, 165 and BCA-60) on the prediction of the movement of a satellite for up to 5 days in advance. The estimates were obtained by comparing the results of numerical integration of the equations of motion of satellites with regard to atmospheric models which considered or did not consider the dynamic changes in the atmosphere. Tables 5; References 16.

[240-6508]

USSR UDC: 629.78.002

PROBLEMS OF MECHANICS IN SPACE TECHNOLOGY. CONTROLLED VIBRATIONAL PROCESSES UNDER WEIGHTLESS CONDITIONS

Moscow PROBLEMY MEKHANIKI V KOSMICHESKOY TEKHNOLOGII. UPRAVLYAEMYYE VIBRATSIONYYE PROTESSY V NEVESOMOSTI in Russian, Mashinostroyeniye 1978, 119 pp

GANIYEV, R. F. and LAPCHINSKIY, V. F.

[From REFERATIVNYY ZHURNAL, RAKESTOSTROYENIYE, No 2, 1979 Abstract No 2.41.151K from the resume]

[Text] This monograph analyzes problems of the mechanics of fluids, including those with solid and gaseous inclusions. Scientific statements of the problem based on controlled processes of technology in space, mathematical models and methods of their investigation are demonstrated and explained for the discussion of the problem of new vibration resonant effects under weightless conditions and the expediency of their use in realizing certain technological processes. The monograph is intended for scientific and engineering-technical workers involved in problems of space technology.

[240-6508]

USSR UDC: 629.78.015:536.7

MAXIMUM LOSS OF MASS OF A BODY DESTROYED BY INTENSIVE RADIANT HEATING AS IT MOVES ALONG A TRAJECTORY

Moscow TEORIYA I EKSPERIMENTAL'NYYE ISSLEDOVANIYA GIPERZVUKOVYKH TECHENIY PRI OBTEKANII TEL I V SLEDAKH [Theory and Experimental Studies of Hypersonic Flows Around Bodies and in Wakes] in Russian, 1978 pp 22-29

APSHTEYN, E. Z., YEFIMOVA, L. G. and PILYUGIN, N. N.

[From REFERATIVNYY ZHURNAL, RAKETSTROYENIYE No 12, 1978 Abstract No 12.41.96 from the resume]

[Text] A study is made of the task of determination of the loss of mass of a body which changes its shape under the influence of radiant heat fluxes as it moves along a trajectory, as well as limiting estimates of the loss of mass of the body. A numerical solution to theproblem is obtained for the cases of flow of a strongly radiating gas around the body, both with constant parameters of the incident flow, and for movement through

a trajectory in the atmosphere of the earth. It is noted that the shape of the body becomes more blunted due to the loss of mass, while the coefficients of drag and heat exchange of the body change significantly along the trajectory. It is noted that the presence of an optically transparent layer of injected gas has little influence on the total loss of mass. Figures 6; References 17.

[242-6503]

USSR

UDC: 629.78.015:
533.6.011.55

NONEQUILIBRIUM CONCENTRATION OF ELECTRONS FOLLOWING A SHOCKWAVE AND AROUND BLUNT BODIES IN A HYPERSONIC AIRSTREAM

Ramenskoye UCHENYYE ZAPISKI TSENTRAL'NOGO AEROGIDRODINAMICHESKOGO INSTITUTA [Scientific Annals of Central Aerohydrodynamice Institute] in Russian Vol 9, No 4, 1978 pp 61-66

POLYANSKIY, O. YU. and SAYAPIN, G. N.

[From REFERATIVNYY ZHURNAL, RAKESTOSTROYENIYE, No 2, 1979 Abstract No 2.41.82 from the resume]

[Text] It is shown that the nonequilibrium concentration of electrons following the passage of a shockwave, assuming the proposed correlation variables, is described with satisfactory accuracy by a universal curve which is little dependent on the density of the unperturbed flow ρ_{∞} or its velocity V_{∞}. Based on the method of correspondence of flows behind a planar shockwave and in the shock layer around blunt bodies, profiles are obtained of the nonequilibrium concentration of electrons n_e on the axis of symmetry from a shockwave to a shpere around which the hypersonic airstream flows. The influence of viscosity was not considered. Results are presented from calculation of n_e near the sphere in the range of speeds from 3 to 6 km/s, of flying altitudes from 15 to 60 km and of sphere radius from $1.5 \cdot 10^{-2}$ to 1.5 m. Figures 5; References 14.

[240-6508]

USSR UDC: 629.78.076.6

EXPERIMENTAL METHODS IN SPACECRAFT DYNAMICS

Moscow EKSPERIMENTAL'NYYE METODY V DINAMIKE KOSMICHESKIKH APPARATOV in Russian Mashinostroyenie 1978, 248 pp

MIKISHEV, G. N.

[From REFERATIVNYY ZHURNAL, RAKETSTROYENIYE No 12, 1978 Abstract No 12.41.76 from the resume]

[Text] This monograph analyzes experimental methods of investigation of the dynamic properties of spacecraft as elastic structures containing fluids. Primary attention is given to mathematical models, definition of their parameters, similarity conditions and the principles of modeling, methods of determination of dynamic characteristics, means of testing of actual objects and their models. The monograph is intended for scientific workers and engineers. It may also be useful to undergraduate and graduate students in higher educational institutions.

[242-6508]

USSR UDC: 629.78.076.6

PREDICTING THE MOVEMENT OF SATELLITES CONSIDERING PERIODIC CHANGES IN THE INDEX OF SOLAR ACTIVITY

Moscow NABLYUDENIYE ISKUSSTVENNYKH NEBESNYKH TEL [Observation of Artificial Heavenly Bodies] in Russian No 74, 1977 pp 71-72

RUDAKOV, S. A.

[From REFERATIVNYY ZHURNAL, RAKETOSTROYENIYE, No 2, 1979 Abstract No 2.41.46 from the resume]

[Text] Results are presented from predictions of the movement of satellites considering periodic changes in the index of solar activity. Analysis of the results showed that the accuracy of prediction increases (for a certain class of orbits) by approximately 40%. A study is made of the possibility of analytic solution of the problem.

[240-6508]

USSR UDC: 629.78.076.6

SOLUTION OF BOUNDARY-VALUE PROBLEMS CONSIDERING ANOMALIES OF THE GRAVITATIONAL FIELD AND THE DRAG OF THE ATMOSPHERE OF THE EARTH

Moscow NABLYUDENIYE ISKUSSTVENNYKH NEBESNYKH TEL [Observation of Artificial Heavenly Bodies] in Russian No 74, 1977 pp 115-120

GLEBOV, V. D.

[From REFERATIVNYY ZHURNAL, RAKESTOSTROYENIYE, No 2, 1979 Abstract No 2.41.48 from the resume]

[Text] A solution is presented of boundary-value problems for orbits passing through two fixed points in space. A quasi-optimal control of the iterational process is used to consider the anomalies of the gravitational field and drag of the atmosphere of the earth. Figures 7; Table 1; References 3.

[240-6508]

USSR UDC: 629.78.015.4

EXPERIMENTAL STUDY OF THE LOAD-BEARING CAPACITY OF SHELL DESIGNS OF A GLASS-EPOXY COMPOSITE MATERIAL

Ramenskoye UCHENYYE ZAPISKI TSENTRAL'NOGO AEROGIDRODINAMICHESKOGO INSTITUTA [Scientific Annals of Central Aerohydrodynamics Institute] in Russian Vol 9, No 3, 1978 pp 137-147

GORLOV, K. V., KRASHAKOV, YU. F. and RUBINA, A. L.

[From REFERATIVNYY ZHURNAL RAKETSTROYENIYE No 12, 1978 Abstract No 12.41.165 from the resume]

[Text] The method and results are presented from an experimental study of the stability of shell structures made of a glass-epoxy composite material under axial compression and flexure. The deformations measured in the process of testing of the structure are used to determine the elastic characteristics of the material, which are compared with the characteristics obtained from testing of standard specimens. The studies were performed on smooth cylindrical and conical shells, as well as cylindrical sandwich specimens containing a plastic-foam filler. Forty shells were tested in all. The results of the experiment show satisfactory agreement with calculated results. Figures 7; References 4.

[242-6508]

USSR

UDC: 629.78.015.5

STABILITY OF A CYLINDRICAL SHELL IN FLEXURE UNDER CONDITIONS OF CREEP

Ramenskoye UCHENYYE ZAPISKI TSENTRAL'NOGO AEROGIDRODINAMICHESKOGO INSTITUTA [Scientific Annals of Central Aerohydrodynamics Institute] in Russian Vol 9, No 3, 1978 pp 148-151

SHCHERBAKOV, V. T.

[From REFERATIVNYY ZHURNAL RAKETSTROYENIYE No 12, 1978 Abstract No 12.41.166 from the resume]

[Text] The stability of a cylindrical shell is calculated, considering initial bending, under conditions of creep in flexure. The critical time of stability is determined on the basis of equations fo deformation under conditions of creep considering geometric nonlinearity and creep relationships linearized with respects to the zero-moment state. Data are presented from calculation of the critical time of cylindrical shells tested for stability under conditions of creep in flexure. Figures 2; References 7.

[242-6508]

CSO: 1861

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